146686AMD2.doc (Amendment 2)

CLAIMS

1. (Amended) A plasma-assisted deposition method for forming an insulating film on a substrate placed on a support device in an airtight processing vessel by activating C_5F_8 gas by a plasma,

characterized in that a space extending between C_5F_8 gas supply openings and a surface of the substrate has an electron temperature of 2 eV or below and an electron density of 5×10^{11} electrons per cubic centimeter or above,

pressure of a processing atmosphere is 19.95 Pa or below, and

the insulating film to be deposited on the substrate is a fluorine-containing carbon film having a relative dielectric constant of 2.3 or below and permitting a leakage current of 5×10^{-8} A/cm^2 or below.

2. The plasma-assisted deposition method according to claim 1, wherein a microwave is guided to a flat antenna member disposed opposite to the support device by a waveguide, and the microwave is radiated from a plurality of slots formed in a circumferential arrangement in the flat antenna member to activate the source gas by the energy of the microwave.

3. The plasma-assisted deposition method according to claim 2, wherein the slots have a length between half the wavelength of the microwave at the side of the waveguide with respect to the flat antenna member and half the wavelength of the microwave at the side of the plasma producing space with respect to the flat antenna member.

4. The plasma-assisted deposition method according to claim 2 or 3, wherein the plurality of slots are arranged on concentric circles having their centers at the center of the flat antenna member or on a spiral around the center of the flat antenna member.

5. The plasma-assisted deposition method according to any one of claims 2 to 4, wherein the microwave radiated from the flat antenna member is a circularly polarized wave or a linearly polarized wave.

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9. (Amended) A plasma-assisted deposition system comprising:

an airtight processing vessel internally provided with a support device for supporting a substrate thereon;

a C_5F_8 gas supply system for supplying C_5F_8 gas for forming an insulating film on the substrate into the processing vessel;

a microwave generator for generating a microwave for activating the C_5F_8 gas to produce a plasma;

a waveguide for guiding the microwave generated by the microwave generator into the processing vessel; and

a flat antenna member connected to the waveguide, disposed opposite to the support device and provided with a plurality of slots formed therein in a circumferential arrangement;

characterized in that C_5F_8 gas is activated by the plasma, a

space extending between C_5F_8 gas supply openings and a surface of the substrate has an electron temperature of 2 eV or below and an electron density of 5×10^{11} electrons per cubic centimeter or above, a processing atmosphere has a process pressure of 19.95 Pa or below, and a fluorine-containing carbon film deposited by a film deposition process on the substrate placed on the support device has a relative dielectric constant of 2.3 or below and permits a leakage current of 5×10^{-8} A/cm^2 or below.

10. The plasma-assisted deposition method according to claim 9, wherein the slots have a length between half the wavelength of the microwave at the side of the waveguide with respect to the flat antenna member and half the wavelength of the microwave at the side of the plasma producing space with respect to the flat antenna member.

11. The plasma-assisted deposition system according to claim 10, wherein the plurality of slots are arranged on concentric circles having their centers at the center of the flat antenna member or on a spiral around the center of the flat antenna member.

12. The plasma-assisted deposition system according to any one of claims 9 to 11, wherein the microwave radiated from the flat antenna member is a circularly polarized wave or a linearly polarized wave.

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